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## TECHNICAL NOTE NUMBER 181

FOREST PRODUCTS LABORATORY - U. S. FOREST SERVICE - MADISON, WISCONSIN

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### MOISTURE-RESISTANT COATINGS FOR WOOD

Shrinking and swelling and internal stresses causing warping and checking are brought about in wood by changes in the moisture content. Such changes are occurring continually when wood is exposed to changing atmospheric conditions, and the only way to prevent or retard them is to protect the wood from the air with some moisture-resistant finish or coating.

In order to determine the protection against moisture afforded by various coatings, a series of tests is being conducted by the U. S. Forest Service, at the Forest Products Laboratory, Madison, Wisconsin. No coating or finish which is entirely moisture-proof has yet been discovered, but several have been found which are very effective.

Linseed oil, although it is probably recommended more frequently than most of the other materials for moisture-proofing wood, was found in the absorption tests to be quite ineffective. Five coats of hot oil followed by two coats of floor wax failed to give any great protection.

Oil paints form a film over wood which is very durable even in exterior locations. Laboratory tests show, however, that such a film, although it may be continuous, does not prevent moisture changes in wood. Graphite paints and spar varnish are about as effective as the ordinary oil paints with the heavier pigments.

Cellulose lacquers rank somewhat higher than the foregoing in moisture-resistance. Considerable improvement can probably be effected in them by the addition of solids. They have the advantage that they are fast drying and that the films they form over the wood are very elastic.



Rubbing varnishes afford considerably more protection against moisture than do spar or long oil varnishes. The larger amounts of gum solids present in rubbing varnishes probably account for their greater moisture resistance.

Enamel coatings made by the addition of pigments, such as barytes, to ordinary varnish are about as effective as rubbing varnish.

A bronze coating composed of a cheap gloss oil and aluminum powder proved in tests to be superior in moisture-resistance to any of the coatings mentioned above. This mixture is very fast drying; three coats can be applied in the course of half an hour.

The aluminum-leaf coating developed at the Forest Products Laboratory, particularly for the protection of airplane propellers, is highly efficient in preventing moisture changes in wood. Such a coating can best be applied to large, unbroken surfaces. The laying of the leaf on small intricate parts or assemblies is less practical.

Some asphalt and pitch paints are highly moisture-resistant. They are rather cheap and may be applied almost any place where their color is not objectionable. Attempts to discover a means of covering asphalt and pitch paints with lighter-colored materials have thus far met with little success.

For temporary protection against moisture changes, vaseline smeared over varnish is one of the most moisture-resistant coatings yet tested. Another temporary protection, a heavy coat of paraffine, is about as effective as rubbing varnish. Neither of these temporary coatings could be used on surfaces subjected to wear.

The following table gives the results of moisture absorption tests on panels coated with the different preparations. The percentages are based on average

amounts of moisture absorbed per unit surface area by coated and uncoated panels subjected to a humidity of 95-100 per cent for 14 days.

	Percentage efficiency
Aluminum-leaf process - asphalt paint base	98
Three coats spar varnish coated with vaseline	98
Three coats of asphalt paint	96
Aluminum-leaf process - spar varnish base	95
Aluminum-leaf process - cellulose lacquer base	94
Aluminum-leaf process - oil paint base	93
Three coats of aluminum bronze (quick drying)	92
Heavy coating of paraffine	91
Three coats of rubbing varnish	89
Three coats of enamel	88
Three coats of orange shellac	87
Three coats of cellulose lacquer	73
Sheet pyralin 5/1000 inch thick glued to wood	68
Three coats of graphite paint	61
Three coats of spar varnish	60
Three coats of white lead oil	54
Five coats of linseed oil applied hot and two coats of wax.	38
No coating	00

